SPECIFICATION

BRANCH PIPE COUPLING AND AIR CONDITIONER PROVIDED WITH THE SAME

TECHNICAL FIELD

The present invention relates to a branching pipe joint and an air conditioner provided therewith.

BACKGROUND ART

Conventionally, there is a so-called separate type air conditioner constituted by connecting outdoor units and indoor units via a connecting piping, such as a gas refrigerant connecting piping and a liquid refrigerant connecting piping. An example of such an air conditioner 1 is one that, as depicted in FIG. 1, disposes a plurality (four units in FIG. 1) of indoor units 3 and branches a connecting piping 4 so that a refrigerant can be distributed therefrom to all indoor units 3, and also disposes a plurality (three units in FIG. 1) of outdoor units 2 and branches the connecting piping 4 (a gas refrigerant connecting piping 5 and a liquid refrigerant connecting piping 6 in FIG. 1) so that the refrigerant can be distributed therefrom to all outdoor units 2.

The following explains the branch structure of the connecting piping 4 for distributing the refrigerant to the plurality of outdoor units 2 and the plurality of indoor units 3, e.g., the gas refrigerant connecting piping 5 that distributes a gas refrigerant to the plurality of outdoor units 2. The gas refrigerant connecting piping 5 principally comprises: a union connecting piping 51 that extends from the indoor units 3 to the plurality of outdoor units 2; a plurality (two in FIG. 1) of branching pipe joints 52 connected to the union connecting piping 51 in accordance with the number of outdoor units 2, and that distribute the flow of the refrigerant to two flows; branch connecting pipings 53 that each conjoin branching pipe joints 52 as needed; and unit branch pipings 54 that each connect one of the branching pipe joints 52 and a connection port 21 of the corresponding outdoor unit 2. Such a gas refrigerant connecting piping 5 is plumbed by connecting one of the branching pipe joints 52 to the union connecting piping 51 by brazing and the like, connecting each unit branch piping 54 to the connection port 21 of the corresponding outdoor unit 2, and connecting each branch connecting piping 53 to the corresponding branching pipe joint 52 by braising and the like. In addition, the branch structure of the gas refrigerant connecting piping 5 for distributing the gas refrigerant to the plurality of indoor units 3 is also constituted by connecting branching pipe joints 55, branch connecting pipings 56, and unit branch pipings 57 to the union connecting piping 51, the same as above. Furthermore, the liquid refrigerant connecting

piping 6 also has a branch structure that includes branching pipe joints 62, 65, the same as the gas refrigerant connecting piping 5.

Furthermore, examples of the branching pipe joints (the branching pipe joints 52, 55 of the gas refrigerant connecting piping 5 in FIG. 1) used to branch such a connecting piping include a Y-shaped branch pipe 81 and a T-shaped branch pipe 91 depicted in FIG. 2 and FIG. 3.

The Y-shaped branch pipe 81 principally comprises a Y-shaped branch part 82, and a first branch nozzle part 83 and a second branch nozzle part 84 connected to the Y-shaped branch part 82. The Y-shaped branch part 82 is a substantially Y-pipe shaped member, and has an inlet pipe part 82a, wherethrough flows the refrigerant that flows in from the union connecting piping or the branch connecting piping (corresponding to the union connecting piping 51 and the branch connecting pipings 53 in FIG. 1), and a first outlet pipe part 82b and a second outlet pipe part 82c, wherethrough flows the refrigerant along a flow direction (hereinafter referred to as the first direction A) of the refrigerant flowing through the inlet pipe part 82a and in directions along the first direction A substantially symmetric to a centerline O-O of the inlet pipe part 82a. The first branch nozzle part 83 is a pipe member connected to the first outlet pipe part 82b, and extends away from the second branch nozzle part 84 and then along the first direction A; further, at the tip thereof a first reducer pipe connecting part 83a is formed, wherein the pipe diameter changes in steps so that it can connect to a differently diametered pipe. The second branch nozzle part 84 is a pipe member connected to the second outlet pipe part 82c, and extends substantially straight along the first direction A; further, at the tip thereof a second reducer pipe connecting part 84a is formed, wherein the pipe diameter changes in steps, the same as the first branch nozzle part 83. Here, even if the unit branch piping (corresponding to the unit branch piping 54 in FIG. 1) to be connected to the first branch nozzle part 83 is a differently diametered pipe, it is still possible to make the connection by brazing and the like because the first branch nozzle part 83 can be made to conform to the pipe diameter of the unit branch piping by cutting the first reducer pipe connecting part 83a using a pipe cutter. In addition, even if the branch connecting piping or the unit branch piping to be connected to the second branch nozzle part 84 is a differently diametered pipe, it is still possible to make the connection by brazing and the like because the second branch nozzle part 84 can be made to conform to the pipe diameter of the branch connecting piping or the unit branch piping by cutting the second reducer pipe connecting part 84a using a pipe cutter, the same as the first reducer pipe connecting part 83a. Furthermore, by making the first reducer pipe connecting part 83a and the second reducer

pipe connecting part 84a shaped so that the first branch nozzle part 83 extends away from the second branch nozzle part 84 and then extends along the first direction A, as discussed above, a spacing is created that can secure the space needed to perform the cutting work with the pipe cutter (corresponding to the spacing S between the portion of the first reducer pipe connecting part 83a nearest the second branch nozzle part 84 side and the portion of the second branch nozzle part 84 nearest to the first reducer pipe connecting part 83a of the first branch nozzle part 83 in FIG. 2).

In addition, the T-shaped branch pipe 91 principally comprises a T-shaped branch part 92, and a first branch nozzle part 93 and a second branch nozzle part 94 connected to the T-shaped branch part 92. The T-shaped branch part 92 is a substantially T-shaped member, and has an inlet pipe part 92a, wherethrough flows the refrigerant that flows in from the union connecting piping or the branch connecting piping (corresponding to the union connecting piping 51 or the branch connecting piping 53 in FIG. 1), a first outlet pipe part 92b, wherethrough flows the refrigerant in a direction substantially orthogonal to the flow direction (hereinafter, referred to as the first direction A) of the refrigerant flowing through the inlet pipe part 92a, and a second outlet pipe part 92c, wherethrough flows the refrigerant in a direction along the first direction A. The first branch nozzle part 93 is a pipe member connected to the first outlet pipe part 92b, and extends in a direction substantially orthogonal to the first direction A; further, at the tip thereof a first reducer pipe connecting part 93a is formed, wherein the pipe diameter changes in steps. The second branch nozzle part 94 is a pipe member connected to the second outlet pipe part 92c, and extends substantially straight along the first direction A; further, at the tip thereof, a second reducer pipe connecting part 94a is formed wherein the pipe diameter changes in steps, the same as the first branch nozzle part 93. Here, even if the unit branch piping (corresponding to the unit branch piping 54 in FIG. 1) to be connected to the first branch nozzle part 83 is a differently diametered pipe, it is possible to make the connection by brazing and the like because the first branch nozzle part 83 can be made to conform to the pipe diameter of the unit branch piping by cutting the first reducer pipe connecting part 83a using a pipe cutter. In addition, even if the branch connecting piping or the unit branch piping to be connected to the second branch nozzle part 84 is a differently diametered pipe, it is possible to make the connection by brazing and the like because the second branch nozzle part 84 can be made to conform to the pipe diameter of the branch connecting piping or the unit branch piping by cutting the second reducer pipe connecting part 84a using a pipe cutter, the same as the first reducer pipe connecting part 83a. Furthermore, because the first branch nozzle part 83 and the second branch nozzle part 84

extend in mutually orthogonal directions, a space is secured between the first reducer pipe connecting part 83a and the second reducer pipe connecting part 84a to perform the cutting work with the pipe cutter.

<NON-PATENT DOCUMENT 1>

1998 Cooling and Heating Handbook—Air Conditioning Volume, Mitsubishi Heavy Industries, Ltd.

DISCLOSURE OF THE INVENTION

PROBLEMS SOLVED BY THE INVENTION

If the Y-shaped branch pipe 81, which is the former branch pipe discussed above, is used as the branching pipe joint, then it is normally disposed so that the Y-shaped branch part 82 faces the horizontal direction and so that the first branch nozzle part 83 and the second branch nozzle part 84 are positioned at the same height (hereinafter referred to as the horizontal branch arrangement). Thereby, the refrigerant that flows in from the union connecting piping or the branch connecting piping into the Y-shaped branch pipe 81 tends not to drift because the refregerant branches in the Y-shaped branch part 82 without any height differential between the directions substantially symmetric to the centerline O-O of the inlet pipe part 82a. However, because the shape of the first branch nozzle part 83 of the Y-shaped branch pipe 81 extends away from the second branch nozzle part 84 and then extends along the first direction A, there is a problem in that a heat insulating material 85 (refer to FIG. 2) must be affixed around the portion of the first and second branch nozzle parts 83, 84 where the first branch nozzle part 83 extends away from the second branch nozzle part 84 in the first direction A from the inlet pipe part 82a of the Y-shaped branch part 82, and the vicinity of the branching pipe joint therefore cannot be made compact. In addition, there is a problem in that it is troublesome to do the finishing work (hereinafter referred to as the racking process) of wrapping tape around the outer circumference of the heat insulating material 85 after affixing it to the connecting piping and then affixing a face cover.

In addition, if the Y-shaped branch pipe 81 is used as the branching pipe joint, then there is a case wherein it is disposed below the connection ports of the corresponding outdoor unit as in the case, for example, where the outdoor unit is installed on a platform. In such a case, the refrigerant piping, such as the unit branch piping, connected to the first branch nozzle part 83 must be disposed so that it stands upward, and it is consequently preferable to plumb so that the Y-shaped branch pipe 81 is disposed so that the Y-shaped branch part 82 faces the horizontal direction and the first branch nozzle part 83 is on the upper side of the second branch nozzle part 84, instead of the horizontal branch arrangement discussed above.

However, if the Y-shaped branch pipe 81 is disposed in this manner, drift occurs such that a large amount of liquid refrigerant, refrigerator oil, and the like, flows to the second branch nozzle part 84 when the gas refrigerant, which accompanies the refrigerant in the vapor-liquid two-phase state and the refrigerator oil, flows inside the connecting piping. Consequently, if the Y-shaped branch pipe 81 is used as the branching pipe joint, then there is a problem in that numerous constraints occur during plumbing work in order to maintain the horizontal branch arrangement.

However, if the T-shaped branch pipe 91, which is the latter branch pipe discussed above, is used as the branching pipe joint, then the portion where a heat insulating material 95 is affixed is just the portion in the vicinity of the first and second outlet pipe parts 92b, 92c of the first and second branch nozzle parts 93, 94 in the first direction A from the inlet pipe part 92a of the T-shaped branch part 92 (refer to FIG. 3), and the vicinity of the branching pipe joint can be made more compact than the case of using the Y-shaped branch pipe 81. However, even if the T-shaped branch pipe 91 is disposed so that it is in the horizontal branch arrangement, the same as the case of using the Y-shaped branch pipe 81, i.e., so that the T-shaped branch part 92 of the T-shaped branch pipe 91 faces the horizontal direction, and is disposed so that the first branch nozzle part 93 and the second branch nozzle part 94 are at the same height position, then the refrigerant that flows in from the union connecting piping or the branch connecting piping into the T-shaped branch pipe 91 branches without any height differential between the directions substantially symmetric to the centerline O-O of the inlet pipe part 82a, but there is a problem in that drift tends to occur in the T-shaped branch part 92 because it does not branch in directions symmetric to the centerline O-O of the inlet pipe part 92a.

Thus, despite using either the conventional Y-shaped branch pipe 81 or the T-shaped branch pipe 91 discussed above as the branching pipe joint, it is not possible to achieve both the prevention of drift in the branch part and a compaction of the vicinity thereof.

It is an object of the present invention to achieve both the prevention of drift in the branch part and a compaction of the vicinity thereof in a branching pipe joint, for distributing the refrigerant flowing inside the main pipe into two flows, and in an air conditioner provided therewith.

MEANS FOR SOLVING THE PROBLEMS

A branching pipe joint according to the first invention is a branching pipe joint for distributing a refrigerant flowing within a main pipe to two flows, comprising a substantially Y-pipe shaped branch part, a first branch nozzle part, a second branch nozzle part, and a first

branch pipe. The branch part comprises an inlet pipe part wherethrough flows the refrigerant that flows in from the main pipe, and a first outlet pipe part and a second outlet pipe part wherethrough flows the refrigerant along a first direction, which is the flow direction of the refrigerant that flows through the inlet pipe part, and along the first direction in directions substantially symmetric to a centerline of the inlet pipe part. The first branch nozzle part is connected to the first outlet pipe part and extends along the first direction. The second branch nozzle part is connected to the second outlet pipe part and extends along the first direction. The first branch pipe is a pipe member, wherein one end part is connected to a tip part of the first branch nozzle during plumbing work, and is bent so that the other end part faces a direction that intersects the first direction in a state connected to the first branch nozzle part. The first branch nozzle part and the second branch nozzle part are disposed so that the spacing between the portion of the tip part of the first branch nozzle part nearest the second branch nozzle part side and the portion of the second branch nozzle part nearest the tip part of the first branch nozzle part is less than or equal to 40 mm.

This branching pipe joint comprises a substantially Y-pipe shaped branch part the same as a conventional Y-shaped branch pipe but, unlike the conventional Y-shaped branch pipe, is structured so that the first branch pipe can be connected to the tip part of the first branch nozzle part during plumbing work. Consequently, this branching pipe joint, unlike the conventional Y-shaped branch pipe, does not have a first reducer pipe connecting part formed at the tip part of the first branch nozzle part, and it is therefore not necessary to secure a space to perform the work of cutting the tip part of the first branch nozzle part using a pipe cutter, and the spacing between the first branch nozzle part and the second branch nozzle part (i.e., the spacing between the portion of the first branch pipe of the first branch nozzle part nearest the second branch nozzle part side of the connecting part and the portion of the second branch nozzle part nearest the first branch nozzle part side) is consequently less than or equal to 40 mm. Thereby, with this branching pipe joint, it is possible to compact the vicinity of the branch pipe more than the conventional Y-shaped branch pipe.

Moreover, because the branching pipe joint is bent so that the other end part thereof faces a direction that intersects the first direction, in a state wherein the first branch pipe is connected to the first branch nozzle part, it is possible to maintain the horizontal branch arrangement of the branch part even if, for example, the refrigerant piping connected to the first branch nozzle part is disposed so that it stands upwards. Thereby, this branching pipe joint can prevent drift of the refrigerant in the branch part.

Thus, this branching pipe joint is structured so that the first branch pipe, which is bent so that it faces a direction that intersects the first direction, can be connected to the tip part of the first branch nozzle part, and it is possible to achieve both a compaction of the vicinity of the branch part and the prevention of drift therein because the spacing between the first branch nozzle part and the second branch nozzle part is reduced.

A branching pipe joint according to the second invention is a branching pipe joint according to the first invention, wherein the first branch pipe is capable of connecting to the first branch nozzle part by brazing. The spacing between the portion of the tip part of the first branch nozzle part nearest the second branch nozzle part side and the portion of the second branch nozzle part nearest to the tip part of the first branch nozzle part is greater than or equal to 7 mm.

It is possible with this branching pipe joint to easily connect the first branch pipe to the tip part of the first branch nozzle part by brazing during plumbing work because the spacing between the portion of the tip part of the first branch nozzle part nearest the second branch nozzle part side and the portion of the second branch nozzle part nearest the tip part of the first branch nozzle part is greater than or equal to 7 mm.

A branching pipe joint according to the third invention is a branching pipe joint according to the first or second inventions, wherein the other end part of the first branch pipe comprises a first reducer pipe connecting part, wherein the pipe diameter changes in steps.

It is possible to connect a refrigerant piping having a different diameter with this branching pipe joint because the first reducer pipe connecting part is formed in the first branch pipe.

A branching pipe joint according to the fourth invention is a branching pipe joint according to any one invention of the first through third inventions, wherein the tip part of the second branch nozzle part comprises a second reducer pipe connecting part that protrudes further than the tip part of the first branch nozzle part toward the first direction side and wherein the pipe diameter changes in steps.

It is possible with this branching pipe joint to secure a space for performing the work of cutting the second reducer pipe connecting part using a pipe cutter because the second reducer pipe connecting part, which is formed at the tip part of the second branch nozzle part, protrudes further than the tip part of the first branch nozzle part toward the first direction side.

A branching pipe joint according to the fifth invention is a branching pipe joint according to any one invention of the first through third inventions, further comprising a

second branch pipe. The second branch pipe is a pipe member wherein one end part is connected during plumbing work to the second branch nozzle part, comprising a second reducer pipe connecting part at the other end part wherein the pipe diameter changes in steps, and extending along the first direction in a state connected to the second branch nozzle part.

It is possible with this branching pipe joint to reduce the size of the branch part in the first direction because it is structured so that the second branch pipe, which extends along the first direction, can connect to the tip part of the second branch nozzle part.

An air conditioner according to the sixth invention comprises: at least one indoor unit; a plurality of outdoor units; a union connecting piping that serves as a main pipe extending from the indoor unit to the plurality of outdoor units; at least one branching pipe joint, according to any one invention of the first through fifth inventions, that is connected to the union connecting piping in accordance with a number of the outdoor units and that distributes the flow of a refrigerant to two flows; and a plurality of unit branch pipings that each connects the branching pipe joint to a connection port of one of the outdoor units.

It is possible with this air conditioner to achieve both a compaction of the vicinity of the branch part and the prevention of drift therein because it constitutes a branch structure that distributes the refrigerant from the union connecting piping to the connection port of each outdoor unit using at least one branching pipe joint according to any one invention of the first through fifth inventions. Thereby, compared with the case of using a conventional Y-shaped branch pipe, it is possible to reduce the troublesome time when performing the racking process after affixing the heat insulating material to the connecting piping.

EFFECTS OF THE INVENTION

The following are the effects obtained according to the present invention, as discussed in the explanation above.

With the first invention, the structure is such that the first branch pipe, which is bent so that it faces a direction that intersects the first direction, can be connected to the tip part of the first branch nozzle part, and it is possible to achieve both a compaction of the vicinity of the branch part and the prevention of drift therein because the spacing between the first branch nozzle part and the second branch nozzle part is reduced.

With the second invention, it is possible to easily connect the first branch pipe to the connecting part of the first branch nozzle part by brazing during plumbing work because the spacing between the portion of the tip part of the first branch nozzle part nearest the second branch nozzle part side and the portion of the second branch nozzle part nearest the tip part of the first branch nozzle part is greater than or equal to 7 mm.

With the third invention, it is possible to connect a refrigerant piping having a different diameter because the first reducer pipe connecting part is formed in the first branch pipe.

With the fourth invention, it is possible to secure a space for performing the work of cutting the second reducer pipe connecting part using a pipe cutter because the second reducer pipe connecting part, which is formed at the tip part of the second branch nozzle part, protrudes further than the tip part of the first branch nozzle part toward the first direction side.

With the fifth invention, it is possible to reduce the size of the branch part in the first direction because it is structured so that the second branch pipe, which extends along the first direction, can connect to the tip part of the second branch nozzle part.

With the sixth invention, it is possible to reduce the troublesome time when performing the racking process after affixing the heat insulating material to the connecting piping.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a schematic block diagram of an air conditioner.

FIG. 2 is an outline drawing of a conventional Y-shaped branch pipe.

FIG. 3 is an outline drawing of a conventional T-shaped branch pipe.

FIG. 4 is an outline drawing that depicts the structure of a branching pipe joint according to one embodiment of the present invention.

FIG. 5 is a cross sectional view taken along the C arrow in FIG. 4.

FIG. 6 is an oblique view that depicts an example wherein branching pipe joints, according to an embodiment of the present invention, are used in the branch structure of a connecting piping for distributing a refrigerant to a plurality of outdoor units.

FIG. 7 is an oblique view that depicts an example wherein branching pipe joints, according to an embodiment of the present invention, are used in the branch structure of a connecting piping for distributing a refrigerant to a plurality of outdoor units.

FIG. 8 is an outline drawing that depicts the structure of a branching pipe joint according to a modified example.

EXPLANATION OF SYMBOLS

1 Air conditioner

2 Outdoor unit

3 Indoor unit

21, 22 Connection ports

51, 53 Union connecting piping, branch connecting piping, (main pipes)

54 Unit branch piping

181 Branching pipe joint

182 Branch part

182a Inlet pipe part

182b First outlet pipe part

182c Second outlet pipe part

183 First branch nozzle part

184 Second branch nozzle part

184a Second reducer pipe connecting part

186 First branch pipe

186a First reducer pipe connecting part

187 Second branch pipe

187a Second reducer pipe connecting part

S Spacing

BEST MODE FOR CARRYING OUT THE INVENTION

Referring to the drawings, a branching pipe joint and an air conditioner provided therewith according to an embodiment of the present invention is described below.

(1) STRUCTURE OF THE BRANCHING PIPE JOINT

FIG. 4 depicts the structure of a branching pipe joint 181 according to an embodiment of the present invention.

The branching pipe joint 181 comprises a substantially Y-pipe shaped branch part 182, a first branch nozzle part 183, a second branch nozzle part 184, and a first branch pipe 186.

The branch part 182 is a portion that has a shape the same as a branch part 82 of a conventional Y-shaped branch pipe 81 (refer to FIG. 2), and comprises: an inlet pipe part 182a, wherethrough flows the refrigerant that flows in from the main pipe (e.g., a union connecting piping 51 and a branch connecting piping 53 of a gas refrigerant connecting piping 5 depicted in FIG. 1); and a first outlet pipe part 182b and a second outlet pipe part 182c, wherethrough flows the refrigerant along a first direction A, which is the flow direction of the refrigerant that flows through the inlet pipe part 182a and in directions along the first direction A substantially symmetric to a centerline O-O of the inlet pipe part 182a.

The first branch nozzle part 183 is connected to the first outlet pipe part 182b, and extends substantially straight along the first direction A. Moreover, at the tip part of the first branch nozzle part 183 a first flared part 183a is formed, wherein the pipe is expanded so that

one end part of the first branch pipe 186 can be inserted, and a first reducer pipe connecting part is not formed as in the first branch nozzle part 83 of the conventional Y-shaped branch pipe 81 (refer to FIG. 2).

The second branch nozzle part 184 is connected to the second outlet pipe part 182c, and extends substantially straight along the first direction A. At the tip part of the second branch nozzle part 184 a second reducer pipe connecting part 184a is formed, wherein the pipe diameter changes in steps. Furthermore, the second reducer pipe connecting part 184a protrudes further than the tip part (specifically, the first flared part 183a) of the first branch nozzle part 183 toward the first direction A side. Thereby, it is possible to secure a space around the circumference of the second reducer pipe connecting part 184a for performing the cutting work with the pipe cutter. Thus, the second branch nozzle part 184 has a shape the same as a second branch nozzle part 84 of a conventional Y-shaped branch pipe 81 (refer to FIG. 2).

Furthermore, unlike the conventional Y-shaped branch pipe 81 (refer to FIG. 2), the branching pipe joint 181 of the present embodiment does not need to secure space around the tip part of the first branch nozzle part 183 to perform the work of cutting such using a pipe cutter, and a spacing S between the first branch nozzle part 183 and the second branch nozzle part 184 (i.e., the spacing between the portion of the first flared part 183a of the first branch nozzle part 183 nearest the second branch nozzle part 184 side and the portion of the second branch nozzle part 184 nearest the first flared part 183a of the first branch nozzle part 183) can consequently be reduced to less than or equal to 40 mm. Thereby, the vicinity of the branch part 182 of the branching pipe joint 181 of the present embodiment can be compacted more that the conventional Y-shaped branch pipe 81 (refer to FIG. 2), the size of the heat insulating material 185 can be reduced when affixing such to the branching pipe joint 181, and the troublesome work when performing the racking process at the outer circumference of the heat insulating material 185 can be reduced.

The first branch pipe 186 is a pipe member wherein one end part is connected to the tip part of the first branch nozzle part 183 during plumbing work. In the present embodiment, the first branch pipe 186 is inserted during plumbing work by approaching the first flared part 183a of the first branch nozzle part 183 from the direction of the arrow B as depicted in FIG. 4, and is connected thereto by brazing. Here, a spacing of at least 7 mm is secured between the portion of the tip part of the first branch nozzle part 183 (specifically, the first flared part 183a) nearest the second branch nozzle part 184 side and the portion of the second branch nozzle part 184 nearest the first flared part 183a. Thereby, it is possible to easily perform the

work of connecting the first branch pipe 186 to the first flared part 183a of the first branch nozzle part 183 by brazing. Namely, with the branching pipe joint 181 of the present embodiment, the spacing S between the first branch nozzle part 183 and the second branch nozzle part 184 is set to a dimensional range of greater than or equal to 7 mm and less than or equal to 40 mm so that the vicinity of the branch part 182 can be made compact while ensuring the efficiency of the work of connecting the first branch pipe 186 to the first branch nozzle part 183 by brazing.

In addition, a first reducer pipe connecting part 186a, wherein the pipe diameter changes in steps, is formed at the other end part of the first branch pipe 186. Furthermore, in the state wherein the first branch pipe 186 is connected to the first branch nozzle part 183, the other end part of the first branch pipe 186 is bent so that it faces a direction that intersects the first direction A (in the present embodiment, a direction substantially orthogonal to the first direction A). Consequently, even in the state wherein the first branch pipe 186 is connected to the first branch nozzle part 183, a space is secured for performing the work of cutting the first reducer pipe connecting part 186a of the first branch pipe 186 using the pipe cutter; furthermore, a space is secured for performing the work of cutting the second reducer pipe connecting part 184a of the second branch nozzle part 184 using the pipe cutter. Thereby, the work efficiency during plumbing is improved.

Moreover, in a state wherein the first branch pipe 186 is connected to the first branch nozzle part 183, the other end part is bent so that it faces a direction that intersects the first direction A. In the present embodiment, the first branch pipe 186 is bent in a direction substantially orthogonal to the first direction A. Consequently, in a state wherein the branch part 182 maintains the horizontal branch arrangement during plumbing work as depicted in FIG. 5 (view taken along the C arrow in FIG. 4), the first reducer pipe connecting part 186a of the first branch pipe 186 can be connected to the first branch nozzle part 183 facing a variety of directions (e.g., arrows D, E, F in FIG. 5), and the problem with the conventional Y-shaped branch pipe 81 (refer to FIG. 2), wherein there is an increase in the number of constraints during plumbing work to support the horizontal branch arrangement, tends not to occur.

As described above, the branching pipe joint 181 of the present embodiment comprises a substantially Y-pipe shaped branch part 182 the same as the conventional Y-shaped branch pipe 81 (refer to FIG. 2); however, unlike the conventional Y-shaped branch pipe 81, it is structured so that the first branch pipe 186 can be connected to the tip part (specifically, the first flared part 183a) of the first branch nozzle part 183 during plumbing work. Consequently, the branching pipe joint 181 is constituted so that the spacing S between

the first branch nozzle part 183 and the second branch nozzle part 184 can be reduced because a first reducer pipe connecting part is not formed at the tip part of the first branch nozzle part 183, unlike the conventional Y-shaped branch pipe 81, and there is therefore no need to secure space for performing the work of cutting the tip part of the first branch nozzle part 183 using the pipe cutter. Thereby, with this branching pipe joint 181, the vicinity of the branch part 182 can be made more compact than the conventional Y-shaped branch pipe 81.

Moreover, with this branching pipe joint 181, in a state wherein the first branch pipe 186 is connected to the first branch nozzle part 183, the other end part of the first branch pipe 186 is bent so that it faces a direction that intersects the first direction A, and it is consequently possible for the branch part 182 to maintain the horizontal branch arrangement even if, for example, the refrigerant piping connected to the first branch nozzle part 183 is disposed so that it stands upward (refer to arrows E, F in FIG. 5). Thereby, it is possible with this branching pipe joint 181 to prevent drift of the refrigerant in the branch part 182.

In other words, this branching pipe joint 181 is structured so that the first branch pipe 186, which is bent so that it faces a direction that intersects the first direction A, can be connected to the tip part of the first branch nozzle part 183, and the spacing S between the first branch nozzle part 183 and the second branch nozzle part 184 can be reduced; consequently, it is possible to achieve both a compaction of the vicinity of the branch part 182 and the prevention of drift therein.

(2) BRANCH STRUCTURE OF A CONNECTING PIPING FOR DISTRIBUTING REFRIGERANT TO A PLURALITY OF OUTDOOR UNITS

The following explains an example of using the branching pipe joint 181 of the present embodiment in a branch structure of connecting piping 4 for distributing the refrigerant to a plurality of outdoor units 2 in an air conditioner 1 depicted in FIG. 1.

FIG. 6 depicts the branch structure for the case wherein the connecting piping 4 and connection ports 21, 22 of the outdoor units 2 are positioned at the same height. In this case, the first branch pipe 186 of each branching pipe joint 181 is connected by brazing to the corresponding first branch nozzle part 183 so that the first reducer pipe connecting part 186a thereof faces toward the corresponding outdoor unit 2 in the horizontal direction (i.e., in the arrow D direction in FIG. 5). Furthermore, each first reducer pipe connecting part 186a is cut using a pipe cutter so that it conforms to the pipe diameter of the corresponding unit branch piping 54, which extends in the horizontal direction and is connected to the connection ports 21, 22 of the plurality of outdoor units 2, and is then connected to the unit branch piping 54 by brazing. However, each second branch nozzle part 184 is cut using the pipe cutter so that it

conforms to the pipe diameter of the corresponding branch connecting piping 53, unit branch piping 54, and the like, and is then connected thereto by brazing. The horizontal branch arrangement of the branching pipe joints 181 is maintained in the branch structure of the connecting piping 4.

In addition, if the connecting piping 4 and the connection ports 21, 22 of the outdoor units 2 are positioned at different heights (e.g., if the connecting piping 4 is positioned lower than the connection ports 21, 22 of the outdoor units 2 by a height H) as depicted in FIG. 7, then it is possible to constitute, as follows, the branch structure of the connecting piping 4 for distributing the refrigerant to the plurality of outdoor units 2. In this case, the first branch pipe 186 of the branching pipe joint 181 is connected to the first branch nozzle part 183 by brazing so that the first reducer pipe connecting part 186a thereof faces toward the outdoor unit 2 in the vertically upward direction (i.e., in the arrow E direction in FIG. 5). Furthermore, the first reducer pipe connecting part 186a is cut using the pipe cutter so that it conforms to the pipe diameter of the unit branch piping 54, which is connected to the connection ports 21, 22 of the outdoor unit 2 and extends in the horizontal direction and then in the vertically downward direction, and then connected to the unit branch piping 54 by brazing. On the other hand, the second branch nozzle part 184 is cut using the pipe cutter so that it conforms to the pipe diameter of the branch connecting piping 53, the unit branch piping 54, and the like, and is then connected thereto by brazing. The horizontal branch arrangement of the branching pipe joint 181 is maintained even in the branch structure of this connecting piping 4.

Thus, by using the branching pipe joint 181 of the present embodiment in the branch structure of the connecting piping 4 for distributing the refrigerant to the plurality of outdoor units 2 in an air conditioner 1, it is possible to achieve both a compaction of the vicinity of the branch part 182 and the prevention of drift therein. Thereby, compared with the conventional Y-shaped branch pipe 81, it is possible to reduce the troublesome work when performing the racking process after affixing the heat insulating material 185 to the connecting piping 4.

(3) MODIFIED EXAMPLE

The branching pipe joint 181 discussed above may be structured as depicted in FIG. 8 so that the tip part of the second branch nozzle part 184 is formed as a second flared part 184b, the same as the first flared part 183a of the first branch nozzle part 183, and so that it has a second branch pipe 187, wherein one end part is connected to this second flared part 184b by brazing (refer to the arrow G in FIG. 8). The second branch pipe 187 is a pipe member that extends along the first direction A in a state connected to the second branch

nozzle part 184, and at the other end part thereof is formed a second reducer pipe connecting part 187a wherein the pipe diameter changes in steps. In addition, because the second flared part 184b of the second branch nozzle part 184 protrudes further than the end part of the first flared part 183a of the first branch nozzle part 183 toward the first direction A side, it is possible to ensure good work efficiency when connecting the second branch pipe 187 to the circumference of the second flared part 184b by brazing.

Thus, with the branching pipe joint 181 of the present modified example, it is possible to reduce the size of the branch part 182 in the first direction A because it is structured so that the second branch pipe 187, which extends along the first direction A, can be connected to the tip part of the second branch nozzle part 184.

(4) OTHER EMBODIMENTS

The above explained an embodiment of the present invention based on the drawings, but the specific constitution is not limited to these embodiments, and it is understood that variations and modifications may be effected without departing from the spirit and scope of the invention.

For example, the branching pipe joint according to the present invention was used in the above embodiments to branch the union connecting piping of the connecting piping to the connection ports of the plurality of outdoor units, but it may be used to branch the union connecting piping of the connecting piping to other units so that, for example, it branches from the union connecting piping of the connecting piping to the connection ports of a plurality of indoor units.

INDUSTRIAL APPLICABILITY

By using the present invention, it is possible to achieve both a compaction of the vicinity of the branch part and the prevention of drift therein of a branching pipe joint, for distributing the refrigerant flowing within a main pipe to two flows, and an air conditioner provided therewith.